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Erroneously Associated with *Bufo compactilis*

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A Western Subspecies of *Bufo woodhousii* Hitherto Erroneously Associated with *Bufo compactilis**

Frederick A. Shannon

The name *Bufo speciosus* Girard was recently revived by Smith (1947) for the subspecies of *Bufo compactilis* Wiegmann occurring north of the Mexican border. A further investigation of the curious, isolated population of supposed *compactilis* occurring in Arizona, Utah, and Nevada was contemplated by Smith, who gathered together from various collections much of the material pertinent to the problem. The actual study was postponed as other duties intervened, however, and eventually, knowing my interest in both the area and in the specific problem, he turned the investigation over to me.

The purpose of this paper is to demonstrate (1) that the Arizona-Nevada-Utah toads, previously known as subspecies of *Bufo compactilis* (*B. c. speciosus*), are actually subspecies of *Bufo woodhousii*, and that they should be known as *Bufo woodhousii microscaphus* Cope; (2) that the ranges of *Bufo woodhousii woodhousii* and *Bufo woodhousii microscaphus* are not overlapping, except in certain intergrading areas; and (3) to propose that *Bufo californicus* be allocated as another subspecies of *Bufo woodhousii* (i. e., *Bufo woodhousii californicus*). It should be emphasized that no subspecies of *Bufo compactilis* is found in Arizona. *Bufo compactilis speciosus* approaches no closer than the southeastern corner of New Mexico.

Most of the material accumulated by Smith was from the U. S. National Museum, the University of Kansas, and the California Academy of Sciences. This material has been augmented by specimens seen by the author while examining the Arizona reptiles and amphibians in the collections of L. M. Klauber, the San Diego Society of Natural History, the University of Southern California, the University of California at Los Angeles, the California Academy of Sciences, Brigham Young University, the University of

*Contribution from the University of Illinois Museum of Natural History and Department of Zoology, Urbana.

Utah, University of Kansas, the Museum of Zoology of the University of Michigan, the Chicago Academy of Sciences, and the Chicago Natural History Museum. A series of 99 specimens of *Bufo c. speciosus* from various localities in Oklahoma, in addition to the material gathered by Smith (*loc. cit.*), was also examined from the collection of the University of Oklahoma. In all, 194 specimens of *Bufo c. speciosus* from Oklahoma, Texas, New Mexico, and Tamaulipas; 94 specimens of *B. c. compactilis* from Mexico; 180 specimens of *Bufo w. woodhousii* from Arizona and Utah; and 88 specimens of *B. w. microscaphus* from Arizona, Nevada, and Utah were examined by the author.

In 1867 Cope proposed the name *Bufo microscaphus* for specimens of toads obtained from the upper Colorado River. His proposal received little recognition, however, and in 1889 Cope himself put the name into the synonymy of *Bufo columbiensis* (*B. b. boreas*). The name of *Bufo compactilis* gradually came to be applied to Cope's toads, and no further taxonomic efforts were applied to them until Linsdale (1940) reported a breakdown in the characters separating *B. w. woodhousii* and *B. compactilis* (i. e., *microscaphus*). He concluded that the species intergraded and relegated *B. w. woodhousii*, *B. w. fowleri* as well as *B. californicus* to subspecific rank under the older specific name of *compactilis*. This nomenclatural change was not widely accepted, partly because of the improbability that two subspecies would have identical geographic ranges over a large part of the western United States.

B. w. microscaphus is easily separated from the subspecies of *compactilis* in that it lacks an outer cutting metatarsal tubercle (as do all subspecies of *woodhousii*), while two cutting tubercles on each foot are found in all individuals of the two subspecies of *compactilis*. Other differences that serve to differentiate *B. w. microscaphus* from *B. c. speciosus* do not hold for the Mexican *B. c. compactilis*. These differences are discussed in the following paragraphs.

1. The most important of these differences is the presence of two palmar tubercles on *B. w. microscaphus*. The second tubercle is located at the base of the thumb (thenar), and it is always bigger than the subarticular tubercle beneath the distal joint of the thumb. The thenar tubercle is in close approximation to the palmar tubercle (*sens. strict.*), and it occurred in every specimen of *microscaphus* examined. Three small specimens of *B. c. speciosus* from the Gulf Coast of Texas have minute tubercles in the thenar position, but they are no larger than other scattered tubercles on the palm of the hand and are certainly much smaller than the subarticular tubercle of the distal thumb joint. The palmar (as differentiated from thenar) tubercle in *microscaphus* is usually acuminate and much longer than broad, while this tubercle in *B. c. speciosus* is usually rounded and only a little longer, as long as, or less long than broad.

2. The difference in shape of the parotoids and the degree of parotoid divergence between the two groups is striking, but difficult to express. The parotoids are noticeably longer and narrower in *B. w. microscaphus* than in *B. c. speciosus*, and the inner edge of the parotoid is more nearly a straight line in the former, while in the latter it is usually decidedly curved. In *microscaphus*, both parotoids were found to be parallel to the midline in 70 per cent of the specimens and at least one parallel to the midline in 90 per cent of the specimens. Only two per cent of the specimens of *B. c. speciosus* had parotoids parallel to the midline.

3. The parotoids are closer together in *B. w. microscaphus*, and this is another noteworthy point of differentiation from *B. c. speciosus*. The shortest distance between the parotoids in the former was less than, or just equal to, the distance from the extreme posterior border of the upper eyelid to the middle of the nostril in 97 per cent of the specimens examined. In only four did this measurement reach the middle of the nostril. The measurement in *speciosus* was equal to or greater than the above in all cases, although in only 70 per cent was it greater.

4. Small pigmented cornifications, present on nearly all specimens of *B. c. speciosus*, are located on the tubercles of the back. There are one or more cornifications to the tubercle. A few specimens of *Bufo w. microscaphus* (usually intergrades) show similar tubercles, but these usually lack dark pigmentation. The dorsum of the leg may have these warts and should not be included in the examination of the back.

Of the above characters it should be noted that only the shiny, black-bordered, cutting outer metatarsal tubercle, the spinose tubercles, and perhaps the parallel nature of the parotoids may be used to differentiate *B. w. microscaphus* from *B. c. compactilis*. The latter may have decidedly developed thenar tubercles. About 68 per cent of the latter have tubercles of varied sizes, although seldom are these larger than the subarticulars of the distal thumb joint. In addition, of course, there is the presence of a black spotted venter on *B. c. compactilis*, as contrasted to the immaculate venter of *B. w. microscaphus*.

The differences separating *B. w. microscaphus* from the species *compactilis* also serve to differentiate *B. w. woodhousii* from *B. compactilis*: longer parotoids, parallel parotoids, and no cutting outer metatarsal tubercle. Specimens of

Bufo w. woodhousii have a thenar tubercle on at least one hand in over 90 per cent of the observed cases. In 70 per cent of these, the tubercle was as large as or larger than that of the distal thumb joint. A few large specimens entirely lacked the thenar tubercle. Indistinct or absent cranial crests, lack of a middorsal stripe, less rugose tuberculation as well as a much smaller size, separate *B. w. microscaphus* from *B. w. woodhousii*. Specimens from the Boulder Dam region in Nevada, from the eastern edge of the Kaibab National Forest

in Arizona and from Prescott show intergrading characters. These Nevada specimens led Linsdale (*loc. cit.*) to his earlier mentioned conclusion, his only error being that of allocation.

An examination of Figure 1 will demonstrate the expected conclusion that the geographic ranges of *B. w. microscaphus* and *B. w. woodhousii* do not overlap, except in intergrading areas. The earlier belief that the two forms were sympatric and the fact that *B. w. microscaphus* had low cranial crests, contrasting to *B. w. woodhousii* and paralleling *B. c. speciosus*, have caused long-standing confusion as to the proper names for these toads.

Typical *B. w. woodhousii* probably does not occur in Nevada. Specimens on the lower reaches of the Meadow Valley Wash and in the Boulder Dam region are perhaps closer to *B. w. woodhousii* than to *B. w. microscaphus*, while the reverse is true in the upper Meadow Valley Wash, but all of them show all stages of intergradation, as do the toads from Indian Spring in the Virgin Mountains, Nevada. Most Utah specimens are closer to *B. w. microscaphus* but show some intergrading characters with the possible exception of those from Zion Canyon.

It is to be hoped that in the future more extensive collecting of northern and north-central Mohave County, Arizona, will be undertaken. A glance at Figure 1 will show how widely separated are the localities from which these amphibians have been taken. This is unfortunately true of most other species of reptiles and amphibians known to inhabit the region.

The lack of material is doubly unfortunate, as northwestern Arizona is a region of considerable subspeciation. Two examples of subspeciation in a manner similar to that shown by *B. woodhousii* are *Crotalus c. cerastes* and *Sauromalus o. obesus* on the Mohave desert, and *Crotalus cerastes laterorepens* and *Sauromalus obesus tumidus* to the south and east. Neither of the latter two is found on the Colorado Plateau.

The range of *Bufo w. microscaphus* seems to be dependent upon the peculiar physiography of northwestern Arizona. The reasons for the eastern range limits are not all apparent. More than half of Arizona is on the Colorado Plateau, which terminates in a range of mountains running roughly from near the northwest corner of the state to the southeast corner. The lowlands to the south and west of this line are studded with low, short ranges of mountains trending northwest-southeast. This portion of Arizona is part of what is called the basin-and-range physiographical province. It includes a majority of Arizona's desert land, and the lowlands have been described as being of the Lower Sonoran Life Zone. The terms Lower Sonoran, Upper Sonoran, Transition and Canadian are useful in a general way as a means of correlating vertical vegetation changes. They will continue to be useful so long as it is remembered that within the altitudinal limits of a given zone

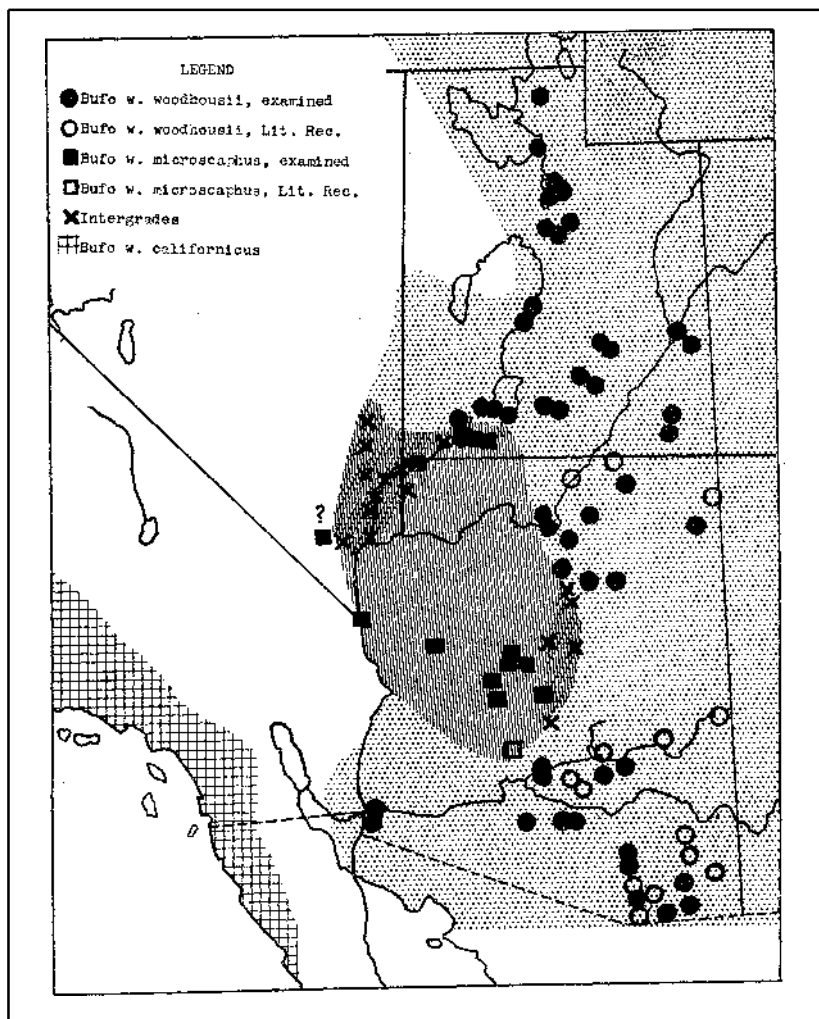


Figure 1. Distribution of southwestern subspecies of *Bufo woodhousii*.

specific, and even generic, composition of the flora may vary tremendously from one locality to another.

The Mohave desert region, represented in Arizona by the western half of Mohave County, is markedly different from the Sonoran desert region of the southwest portion of the state. Although creosote bush is common to both, even the tourist notes that the Joshua trees of Mohave County are not to be found farther south. In turn, the Sonoran desert may be divided into the more xeric Colorado desert around Yuma, and a less extreme region, the Arizona desert, occupying the rest of the southwestern portion of the state.

If the associates or association terminology of some ecologists be used, it must be remembered that in Arizona facies (or faciations) of these communities as represented on the plateau are different from those of the highlands off the plateau. Thus the pinyon juniper association of the Colorado Plateau gives way to evergreen oak-alligator juniper in the mountains south of the plateau.

Bufo w. microscaphus is limited on the west by the Colorado River, although a crossing has been effected in the Lake Mead area. It has spread into the sagebrush subclimax and oak-pinyon-juniper north of the Colorado River and thence into southern Utah, where it intergrades in the vicinity of St. George with *B. w. woodhousii*. The Grand Canyon is apparently not as great a factor in subspeciation as was formerly believed. Whereas the subspecies of *Cro-talus viridis* split beautifully around the canyon, others such as *Phrynosoma douglassii hernandesi* cross unchanged, to subspeciate farther north. The tonguelike extensions of intergrading specimens up the drainage of southeastern Nevada may be, as Linsdale (*loc. cit.*) suggests, remnants of a more mesic era. To the east *microscaphus* invades the edge of the Colorado Plateau and may be found in the chaparral and oak-pinyon-juniper associations, but it does not extend into the montane forests around Flagstaff. In the two latter associations the toads are undoubtedly confined to the grasslands around Flagstaff and to the more temperate lowlands, such as may be found in canyons. The same would be true of the oak-pinyon-juniper extending northwest of Flagstaff to the Grand Canyon and beyond the canyon to the north. The toads probably do not flourish on the plateau and give way through a narrow belt of intergradation to *B. w. woodhousii*. What reasons other than competition have combined to prevent the spread of *B. w. microscaphus* into the Arizona desert from Phoenix to Tucson affords interesting speculation. The Arizona desert (as a division of the Sonoran desert subregion) around Wickenburg, where the toads flourish, does seem to be vegetationally different from that to the southeast, and there is a possibility of two different faciations.

Color of type. The ground color is light tan with a profusion of small, irregularly shaped, chocolate brown spots on dorsum of head, legs and body.

Cope (1867) listed the type series of *microscaphus* as a collection made by Dr. Coues on the Colorado River. Cope stated that Coues followed the 35th parallel across Arizona to the Colorado River where the specimens were collected on the river between Forts Mohave and Yuma. He adds two specimens collected by H. B. Mollhausen from "the upper Colorado" (USNM 4106 and 4184) to the cotypical discussion. One of these (4106) is missing. Two specimens have been included in the museum records under the number 4184. One is a normal appearing *B. w. woodhousii* collected by Mollhausen, possibly in Navajo County, Arizona. The other is *B. w. microscaphus*, and as *B. microscaphus*, formed a part of Cope's type description. Why the *B. w. woodhousii* was given the same number is an unanswered question. Cope gave no impression that two toads had been included under the number, and there is little possibility that he would have confused the strongly crested specimen with his *microscaphus*. The specimen was probably unwittingly assigned the same number by a cataloger. Cope's specimen, USNM 4184, is hereby designated the lectotype of *Bufo woodhousii microscaphus* and Fort Mohave, Mohave County, Arizona as the type locality by restriction.

Redescription of type. An adult female 68.5 mm. long. The specimen is rather smooth dorsally, with occasional small tubercles; surface of tibia tuberculate dorsally, each small tubercle with one discolored cornification; venter granular; ventrum of forearms granular; ventrum of metatarsals granular. Dorsum of head and parotoids smooth, entirely lacking tuberculation. Supraorbital and postorbital crests evident, but low-lying, smooth, and inconspicuous; supraorbital crests slightly convergent anteriorly; preorbital, occipital, preparotoid and post-tympanic crests absent. Tympanum half, or less than half, the area of eyelid; longest tympanal diameter in vertical or oblique plane; canthal ridge rounded. Palmar tubercle subacuminate; thenar tubercles well developed and larger than subarticular tubercles of first finger; progress in finger size 2-4-1-3. With the femora and adpressed tibiae at right angles to the body, the heels are separated by a distance of 3 mm. Metatarsal fold moderately developed; inner metatarsal tubercle cutting; outer metatarsal tubercle flat, small and not cutting; toes, with exception of 4th, two-thirds to three-fourths webbed.

Measurement of type in mm. Total length 68.5; interchoanal width 6; internasal width 4.5; nares to eye 5.5; interorbital width 8; width of eyelid 9.4; right parotoid length 13.5; right parotoid width 7; narrowest interparotoid width 12 (posterior margin of eyelid to nares width 15); largest diameter of tympanum 5.5; right foot length 42.5.

Venter unblemished and dull yellow except for a few small black spots on the mandibular surface.

Remarks. The lectotype is unfortunately atypical in presentation of a well blotched skin, which is only rarely seen in the subspecies.

A brief discussion of *Bufo californicus* should be included here. Among his reasons for removing *Bufo californicus* as a subspecies of *Bufo cognatus*, Myers (1930) pointed out that *B. cognatus* has a single palmar tubercle, while *B. californicus* has two; that *cognatus* has an outer cutting metatarsal tubercle, while *californicus* has this tubercle reduced to a small horny point; that crests of *californicus* are less distinct than those of *cognatus*. These features in *B. californicus* are identical to those shown by *B. w. woodhousii*. Linsdale (*loc. cit.*) carried the idea further and stated that, in the absence of consistent morphological differences, the California form should be called *Bufo compactilis californicus*. The writer shares these views, and allocates the toad as *Bufo woodhousii californicus*. There is a certain danger in naming subspecies from discontinuous ranges but at the present time the writer feels that such an action is closest to the truth. *B. w. woodhousii* is apparently narrowly separated from *californicus* in extreme southern California. Considerable study and collecting will be necessary to determine the status and range of *B. w. microscaphus* in the Las Vegas Valley. As Linsdale said (*loc. cit.*), however, these small, greenish toads with small black dorsal markings can easily be picked out of a mixed collection.

Locality Records. Each of the following lists of locality records has one or more museum numbers attached to it. These numbers represent specimens seen by the writer, except as otherwise indicated. In some cases literature records are included. For each county these are appended to the list of specimens seen and are labeled *Lit. Rec.* In most instances there can be little doubt as to accuracy of allocation. Where any reasonable doubt exists, a question mark follows the citation. Names of counties are printed in *italics*.

Museum abbreviations are as follows:

AMNH	American Museum of Natural History
BYU	Brigham Young University
CA	Chicago Academy of Sciences
CAS	California Academy of Sciences
CNHM	Chicago Natural History Museum
LMK	Private collection of Laurence M. Klauber
MVZ	Museum of Vertebrate Zoology, University of California
SDSNH	San Diego Society of Natural History
UCLA	University of California at Los Angeles
UIMNH	University of Illinois Museum of Natural History

UMMZ University of Michigan Museum of Zoology

USNM United States National Museum

UU University of Utah

Color of type. The ground color is light tan with a profusion of small, irregularly shaped, chocolate brown spots on dorsum of head, legs and body.

An attempt has been made to examine the whole of the Arizona literature for records of both subspecies and, in the case of *B. w. microscaphus*, also that of Utah and Nevada. No attempt was made to compile complete records for Utah except in intergrading regions. Southern Utah records received more attention, as it was considered desirable to determine the range of *B. w. woodhousii* as accurately as possible.

Bufo woodhousii woodhousii Girard

ARIZONA: Apache—Ganado, CNHM 51733; E. Branch Apache River, Apache National Forest, UMMZ 84693; Springerville, USNM 52114-6*; Mt. Tunitcha in the Chuska Mts., USNM 60491*. *Cochise*—West of Tombstone on San Pedro River, LMK 4910-1; 10 mi. s.e. Willcox, UMMZ 271023; Ramsey Canyon, Huachuca Mts., SDSNH 14422-7; Carr Canyon, Huachuca Mts., UMMZ 70010-1; North Miller Canyon, UMMZ 75717-20, 72634; Apache, USNM 8505, 8548*. *Coconino*—Tuba City, LMK 6061, SDSNH 12736-7, BYU 803, 804; Leupp, LMK 29254; Lee's Ferry, USNM 5551*. Lit. Rec.: Tanner's Gulch, 3 mi. n. Tuba City (Stejneger, 1890); San Francisco Mt. (Girard, 1854—type loc. and description). Gila—Miami, UMMZ 91970; McMillanville, USNM 54566*. Lit. Rec.: Roosevelt Dam (Little, 1940). Graham—Fort Grant, USNM 24568-9*; Graham Mts., USNM 51771*. Lit. Rec.: Safford (Slevin, 1928). *Mari-copa*—Phoenix, CAS 17719, 35293-4; 5 mi. s. of Phoenix, CA 13704; 13 mi. s. of Phoenix, CA 13294-7; Cave Creek, CAS 17578 (intergrade); Tempe, USNM 17641-2*; Higley, USNM 63062-3*. Navajo—Laguna Creek at Tsegi Canyon, UU 1633, 1639; Shonto Canyon, 20 mi. s.w. of Marsh Pass, UU 1643; 4 mi. e. of Winslow, UMMZ 59842; Betatakin Ruin, LMK 34627, 34678-9; Winslow, CNHM 51734. Lit. Rec.: Fort Apache (Cope, 1889); White River Canyon, n. of Fort Apache (Cope, 1889); Dogoszhi Biko above Bat Woman Canyon (Eaton, 1935); Rainbow Lodge (Eaton, 1935). Pima—Xavier, LMK 32492; Tucson, SDSNH 1404-19, UCLA 2842; Continental, UCLA 368; Fort Lowell, UCLA 462. Pinal—Florence, CA 10170; 8 mi. n.w. of Florence, CA 12932; one-half mi. n. of Florence, CA 10171; 2 mi. n. of Florence, CA 13491, 13495, 4 mi. w. of Florence, CA 12933, 13492-4, 12647, 9552, 1554-9, 10172; Casa Grande, LMK 29337; 9 mi. e. of Casa Grande, LMK 34050; 30 mi. w. of Casa Grande, LMK 32512; Coolidge, SDSNH 14420-1; Arboretum, 4 mi. w. of Superior, CA 13493-4; 8 mi. w. of Superior, CA 9735. *Santa Cruz*—Tubac, SDSNH 14428-30; 7 mi. s. of Tumacacori National Monument, SDSNH 17912, 17915; 5 mi. s. of Tumacacori National Monument, SDSNH 17913; 3 mi. n. of Nogales, SDSNH 17914; Nogales USNM 2536*. Lit. Rec.: Camp Crittenden, near Patagonia (Yarrow, 1875). Yavapai—Camp Verde, USNM 59778 (slight intergrade). Yuma—Yuma, LMK 2584-5, 34967, SDSNH 14399-14403, CAS 17718, 33723-7, 33800, UMMZ 64925-6; Somerton, LMK 26828-31, UCLA 625.

NEVADA: (All intergrades). Clark—Pahvent, MVZ 43858; Las Vegas, MVZ 8903, 2584; Indian Spring, Virgin Mts., MVZ 19460; Mesquite, LMK 22746-7. Lit. Rec.: 8 mi. n. of Moapa, Bunkerville, 25 mi. above Boulder Dam, 2 mi. s.e. of Overton, Saint Thomas, near mouth of Virgin River (Linsdale, 1940). *Lincoln*—1 mi. s. of Caliente, MVZ 20671, 20673, 20675; 7 mi. s. of Caliente, MVZ 12893, 12895-7; 21 mi. s. of Caliente, MVZ 12891, 12903.

UTAH: (All Lit. Rec.): *Washington*—*St. George* (probably intergrades), Bellevue, Foot of the Pine Valley Mts., Tanner (1931). *San Juan*—*Bluff*, Blanding, La Sal, Tanner (1931); La Sal Creek, Warner Ranger Station, Tanner and Hayward (1934). *Grand*—*Moab*, Tanner (1931). *Emery*—*Green River City*, Tanner (1931). *Utah*—*Provo*, Fairfield, Utah Lake, Thistle, Spanish Fork, and Payson, Tanner (1931). *Wasatch*—*Little Cottonwood Canyon* in the Wasatch Mts., Tanner (1931). *Salt Lake*—*Fort Douglas* and *Salt Lake City*, Tanner (1931). *Cache*—*Logan*, Tanner (1931). *Iron*—*Cedar City* and *Parowan*, Tanner (1931). *Kane*—*Kanab*, Tanner (1931). *Garfield*—*Panguitch*, Tanner (1931); *Boulder*, *Steep Creek*, *Tropic*, *Escalante*, and junction of *Boulder Creek* and *Escalante River*, Tanner (1940). *Sevier*—*Richfield* and *Sabina*, Tanner (1931). *Sanpete*—*Moroni*, *Fort Green*, *Mt. Pleasant*, *Fairview*, and *Indianola*, Tanner (1931). *Juab*—*Nephi*, Tanner (1931). *Millard*—*Lynndale* and *Gandy*, Tanner (1931).

Bufo woodhousii microscaphus Cope

ARIZONA: *Coconino*—*Long Valley*, LMK 21023-6 (intergrades); *Coconino National Forest*, UMMZ 79170 (2), both intergrades; *Oak Creek Canyon*, 28 mi. s. of Flagstaff, UIMNH 2430, 2432-5, 2461. *Maricopa*—*Wickenburg*, USNM 73726-8; *Marinette*, AMNH 53613*. *Mohave*—*Wickieup*, SDSNH 17309-11; *Littlefield*, UMMZ 91769 (intergrade); *Fort Mohave*, USNM 4184—type locality by restriction. *Yavapai*—*Prescott*, USNM 2287, 22914, 27611, 38060, 41666, 57608, 57610, 57612-3; *Fort Whipple*, USNM 54551; *Yarnell*, CA 3147, 3161-70, 3436; 3 mi. n. of *Wickenburg*, CA 3030-4, 3036; 5 mi. n. of *Wickenburg*, CA 2878-85, 2912-8, 2931-2, 2942, 2965; 1½ mi. n. of *Rock Springs*, LMK 33188-90; *Senator Mts.*, CAS 4041; *Weaver (Weaverburg)*, USNM 73726; near mouth of *Beaver Creek*, *Verde River*, UMMZ 84785, 84789 (intergrade); *Camp Verde*, USNM 59776, 59783-4 (all intergrades); between *Fort Wingate* and *Fort Whipple*, near *Prescott*, USNM 24577* (?).

UTAH: *Washington*—*Zion National Park*, MVZ 8908, 12250-2, 12254, 12744, 12746, 12748, 12751; *Middletown*, MVZ 29838, 29840, 29843. Lit. Rec.: *St. George* and *Bellevue*, Tanner (1931); *Rockville* and *Springdale*, Wright and Wright (1949).

In addition to the heads of the above mentioned museums, I am grateful to W. Leslie Burger, Philip W. Smith, and I. Lester Firschein for helpful suggestions in the preparation of this paper and to my wife, Ellen Jordan Shannon, for drafting the map. My thanks are also due William Robertson for useful advice on those sections pertaining to ecology. Dr. Doris Cochran has been more than helpful, with frequent demands on her time and in aiding in the selection of a type specimen for *B. w. microscaphus*. For this I am grateful. I am especially indebted to Dr. Hobart M. Smith, not only for specimens examined but for helpful criticism and advice.

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	Key to the Subspecies of <i>Bufo woodhousii</i> and <i>Bufo compactilis</i>	
1 a	A cutting, usually glossy black-edged outer metatarsal tubercle	2
1 b	Outer metatarsal tubercle not cutting; usually reduced to a round, wart-like production	3
2a (1a)	Venter liberally marked with black spots	<i>B. c. compactilis</i> .
2b	Venter immaculate, light	<i>B. c. speciosus</i> .
3a (1b)	Cranial crests low or absent; no vertebral light line	4
3b	Cranial crests strongly developed; a contrasting vertebral light line	5
4a (3a)	Parotoids broadly oval and divergent; dorsum covered with dark spots	<i>B. w. californicus</i> .
4b	Parotoids elongate and nearly parallel; spotting reduced or absent (except fine black punctations on backs of toads from Vegas Valley, Nevada)	<i>B. w. microscaphus</i> .
5a (3b)	Two to five tubercles in each dorsal blotch; postorbital ridge in contact with tympanum; snout-vent length usually less than 80 mm.	<i>B. w. fowleri</i> .
5b	Only one or two tubercles in each dorsal blotch; postorbital ridge rarely in contact with tympanum; snout-vent length usually more than 80 mm. in adults.	<i>B. w. woodhousii</i> .

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